

**ELECTRONICS & COMPUTER ENGINEERING DEPARTMENT**

**COURSE OUTLINE**

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**CALENDAR DESCRIPTION**

**ELEN 144      SEMICONDUCTOR DEVICES 1**

This course introduces students to the fascinating world of active devices. It covers essential topics from basic semiconductor theory through transistors and Op-Amps to L.C.D.s. The emphasis of this course is in the application of these devices and their troubleshooting, providing the student with a thorough foundation upon which to develop skills in electronics.

OFFERED:	First Semester
CREDIT:	4
IN-CLASS WORKLOAD:	4 Lecture, 2 Lab for 14 weeks
OUT-OF-CLASS WORKLOAD:	7
PRE OR COREQUESITES:	ELEN 142 (or ECET 140)

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**OBJECTIVES:**

Upon completion of this course the student will have an understanding of commonly used analog electronic components and circuits.

**OUTLINE:**

**1. Diodes**

- 1.1 The conductor and insulator
- 1.2 Doping
- 1.3 N and P type materials
- 1.4 Biasing the PN Junction
- 1.5 Diode characteristics
- 1.6 Zener Diode characteristics
- 1.7 Light-emitting diodes
- 1.8 Photo diodes and laser diodes
- 1.9 Schottky diodes
- 1.10 Varactor, Tunnel and other miscellaneous diodes
- 1.11 Varistor and other commonly used diodes
- 1.12 Half and full wave rectifier circuits
- 1.13 Diode Applications

**2. Introduction to Bipolar Transistors**

- 2.1 BJT construction
- 2.2 Biasing BJT's
- 2.3 BJT characteristics
- 2.4 Temperature effects on biasing voltages
- 2.5 Troubleshooting transistor bias circuits

**3. Transistor AC Amplifiers**

- 3.1 Common emitter amplifier
- 3.2 Common collector amplifier
- 3.3 Common base amplifier
- 3.4 Class A amplifiers
- 3.5 Class B and class C amplifiers
- 3.6 Types of distortion
- 3.7 RC phase shift oscillator
- 3.8 Colpitts oscillator
- 3.9 Harley and other oscillators
- 3.10 Crystal controlled oscillators

**4. Field Effect Transistors**

- 4.1 JFET characteristics
- 4.2 JFET biasing
- 4.3 JFET amplifiers
- 4.4 D type mosfets
- 4.5 E Type mosfets
- 4.6 MOSFET amplifiers

**5. Amplifier Frequency Response**

- 5.1 Low Frequency Amplifier Response
- 5.2 High Frequency Amplifier Response
- 5.3 Total Amplifier Frequency Response
- 5.4 Frequency Response of Multistage Amplifiers
- 5.5 Switching characteristics

**6. Operational Amplifiers**

- 6.1 Differential amplifier
- 6.2 OP AMP characteristics
- 6.3 Various OP amp circuits

**7. OP-Amp Circuits**

- 7.1 Passive filters
- 7.2 Low pass filters
- 7.3 High pass filters
- 7.4 Band pass/stop filters
- 7.5 Wien bridge oscillator
- 7.6 Relaxation oscillator

**8. OP-Amp Related Devices**

- 8.1 Transimpedance amplifier
- 8.2 Voltage comparators
- 8.3 Electronic timers
- 8.4 555/ XR 2240
- 8.5 Monostable/Astable Operation

**9. Unregulated and Regulated Power Supplies**

- 9.1 Zener regulator
- 9.2 Emitter follower regulator
- 9.3 Variable feedback regulator
- 9.4 Linear and Switching regulator
- 9.5 Other IC regulators
- 9.6 Basic power supply design
- 9.6 Determining power supply component values

**10. Thyristors and Unijunction Devices**

- 10.1 Shockley diodes and basic thyristors
- 10.2 SCR characteristics
- 10.3 Diac's characteristics
- 10.4 Triac's characteristics
- 10.5 UJT's, IGBTs and more

**11. Miscellaneous Devices**

- 11.1 Solar cells, LCD's, Speakers, Motors, Batteries etc. as time permits

**LABORATORY EXERCISES**

There will be a total of 13 lab exercises to be completed, one per week of the semester. Each exercise will be of 2 hours duration and all must be completed satisfactorily in order to gain a credit for ELEN 144. Labs will be available on D2L on Monday every week. Preparation must be completed by the student before the start of the lab.

**A minimum of 60% must be achieved in both the theory and lab portions to pass the course.** Less than 60% in either portion will result in a failure of the entire course.

The final grading is based on 90% of theory work, and 10% of lab evaluation. Lab evaluation will be based on completing all assigned exercises and lab reports. Labs are to be completed within the assigned lab period and evaluated as satisfactory or unsatisfactory. Any unsatisfactory lab reports must be redone until a satisfactory level is achieved.

**Attendance and completion of all lab material is mandatory to complete the course. Attendance at all tutorials is also compulsory.**

**Quizzes may be given at any time without prior notice and will be based on the current class notes, example problems and any textbook reading assigned.**

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### **OVERALL COURSE EVALUATION:**

Assignments/Quizzes	10 %
Midterm exam	30 %
Final exam	50 %
Laboratory	10 %
<b>TOTAL:</b>	<b>100%</b>

### **TEXTS AND REFERENCES**

**Electronic Devices** 6<sup>th</sup> Edition (or newer)  
Floyd Thomas L. ISBN 0-13-028484-X

**Laboratory Exercises, Handouts and Course Outline**  
Typically available both online and in class

**Optional Book available: (Used for ELEN 142 – Circuit Analysis)**

**Circuit Analysis with Devices** 2<sup>nd</sup> Edition (or newer)  
Robbins and Miller ISBN 140187984-5

### **GRADING (in accordance with College policy):**

<b>A+</b>	90 – 100%	<b>B-</b>	70 - 72%
<b>A</b>	85 – 89%	<b>C+</b>	65 - 69%
<b>A-</b>	80 – 84%	<b>C</b>	60 - 64%
<b>B+</b>	77 – 79%	<b>D</b>	50 - 59%
<b>B</b>	73 – 76%	<b>F</b>	< 50%